



US Army Corps  
of Engineers

# DCAF Bulletin

## Design Construction Analysis Feedback

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### CEMP-EC

**Subject:** Common Deficiencies on Airfield and Other Heavy Duty Pavement

**Applicability:** Information

This Bulletin is published to convey heavy duty pavement installation information noted by the Transportation Systems Center, 215 North 17th Street, Omaha, NE in their support mission to Corps districts and others. These deficiencies relate to work covered by Corps Guide Specification CEGS-02753 (old CEGS 2513) and all situations have resulted from failure to strictly follow the CEGS. The deficiencies primarily apply to slipform concrete paving, but may apply to other systems as well. Almost all the referenced testing is a Contractor Quality Control (CQC) responsibility. However in order for Government Quality Assurance (QA) personnel to verify that contractor (CQC) personnel do their job they need to be very familiar with the following requirements.

**Qualifications and Testing:** CQC personnel and finishing foremen should be American Concrete Institute (ACI) certified technicians or inspectors as required in the CEGS. The CEGS allows for other equivalent training to the satisfaction of the Contracting Officer, but ACI certification should be required. Also, CQC personnel are often lax in their execution of tests required in the specifications such as surface smoothness, and testing pilot lane edges and edge slump. The CEGS has been modernized to permit the use of a profilograph in place of a straightedge in many cases and thus simplify these tasks, but QA personnel must be more strict in requiring performance by CQC personnel.

**Aggregate Testing:** The deleterious material testing provisions of the CEGS must be performed properly by CQC personnel. Failure of CQC personnel to accomplish this testing on time can result in inclusion of "popout forming particles" which are unacceptable to a customer using jet engines on the pavement. Often the contractor sends the aggregate samples to a laboratory without sending the specification requirement and asks for "a petrographic test" which is more detailed and expensive, but does not result in identification of deleterious particles. QA personnel should verify that the

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requirements specified are tested for and met. A satisfactory service record of the source of aggregate should be obtained over several years to establish proper previous performance of the aggregate. This step should not be bypassed and the aggregate for each project also must be tested by the contractor.

**Dowels:** The dowel alignment criteria in the CEGS are strict (1/8 inch in 12 inches), but they can and must be met. Alignment can be tested using a small level and carpenter's square. Dowel misalignment can cause cracks to occur in line with one end of the dowels as the pavement goes through yearly cycles. The use of a dowel inserter mounted on the paver to install dowels for longitudinal **construction** joints in plastic concrete is prohibited by the CEGS. They should not be brought to the job site since their use results in misaligned dowels and major voids around the dowels. Use of the type of paver mounted dowel inserter to install dowels in longitudinal and transverse **contraction** joints in plastic concrete is allowed. For slip formed applications, the only proper means of dowel insertion in longitudinal **construction** joints is to drill properly aligned dowel holes in the hardend concrete and epoxy bond dowels in them. The CEGS requires that epoxy material be injected into the back of the hole before inserting the dowel. If the dowel is buttered with epoxy and then inserted, the epoxy is scraped off as it goes past the collar of the hole.

**Equipment:** The CEGS calls for the paver-finisher to be a heavy duty, self propelled machine designed specifically for paving and finishing high quality concrete. It shall weigh at least 2200 lb. per foot of lane width and be powered by an engine having at least 6.0 horsepower per foot of lane width. (This requirement allows the use of any heavy duty machine on the market, but keeps out bridge deck finishers and similar equipment - there is a large gap between the two groups). Clary screeds or other tube finishers, or "bridge deck" finishers are not allowed. The contractor should be advised early that the specified equipment is mandatory and that the prohibited equipment is not suitable to handle full-depth heavy airfield pavement. A separate transfer-spreader is normally to be used to spread the concrete in front of the paver. The option of allowing the contractor to dump trucks directly in front of the paver on the base course should be permitted sparingly and only when there is a well stabilized base course and the contractor can demonstrate that there is no deterioration of the base course.

The vibrators must be checked for amplitude and frequency as specified. The performance of the vibrators needs to be checked visually for tracking or rock pockets on the slab sides. The paver finisher is required to be adjusted and operated so that it has

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continuous forward movement and hand finishing is done sparingly by use of cutting straightedges. Hand finishing is permitted for isolated small and odd shaped slabs. When use of a fabric drag, burlap or other, is specified, it is a good finishing method if the burlap or other material is kept clean and moist, but not wringing wet. The practice of using a "bull float" behind the paver-finisher should be kept to an absolute minimum. The practice of spraying water on the surface being finished should never be permitted. This makes finishing easier but degrades the concrete surface.

**Edge Slump:** The CEGS has very strict requirements on the amount of edge slump that is allowed on pilot lanes. The repair of edge slump with anything (concrete or paste) at any time (fresh or hardened concrete) is prohibited. Control of edge slump is critical to our customers because edge slump creates places for water to collect. The strict requirement is that excessive edge slump can only be corrected by replacing the whole individual slab and this must be enforced. With proper equipment, mixtures, and procedures, it is quite feasible to meet criteria.

**Joints:** Contraction joints are normally sawed into the finished pavement after the concrete has set sufficiently so as not to ravel but before the concrete experiences random cracking. This period of time is determined by experience on each job. One occurrence of cracking on the job may be excusable but no more than one. The location of the joints should not be altered without the approval of the designer. Joints are the weakest part of the pavement and their location makes a difference in how the pavement performs. The CEGS requires a joint inspection by the Government and contractor on the pilot lanes the day after sawing to determine if most joints have developed a crack on the joint line. If cracks have not developed on approximately 80 percent of the sawed joints, the contractor is to be made to saw joints deeper for the remaining paving. All joints must be properly aligned from edge to edge and end to end of the pavement within specified tolerances, with no irregularities. Expansion joints must be constructed with rigid joint filler material extending to the bottom so as not to allow point-to-point contact across the joint. "Special" (undercut) joints, when used, must be carefully constructed by filling with concrete and hand vibrating before the paver reaches the joint location. Contractors have attempted to fill this type of joint using the paver, and often the undercut area does not get filled which is the important part for proper load transfer.

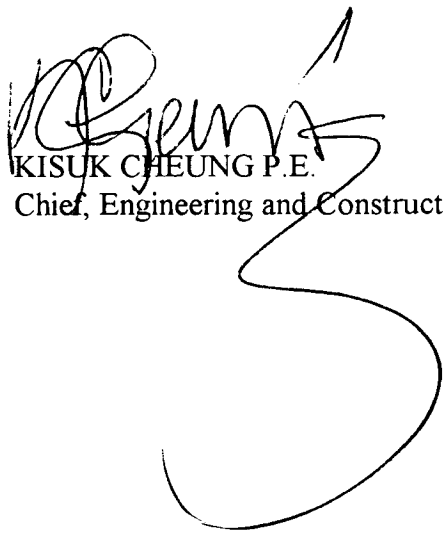
**Curing:** Curing the concrete is vital for a quality pavement. Curing compound must be applied uniformly and completely. Lack of maintenance in cleaning or replacing the nozzles on the applicator, or having them set at a wrong angle or height is usually responsible for uneven or partial application. Also, when joints are sawed after the curing

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compound has been applied there is a tendency to be lax about immediately reapplying the curing compound. Proper curing is especially important at joints, since that is the location of most deterioration of the pavement. Each day the CQC team must measure the amount of curing compound used and compare this with the area paved.

The above guidance comes from the experience of the Transportation Systems Center particularly Mr. Oswin Keifer, CENWD-NP-ET-E, 503-808-3835 and Mr. Terry W. Sherman, CENWO-ED-TX, 402-221-7260. HQUSACE point of contact is Stanley Green, 202-761-0206.



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